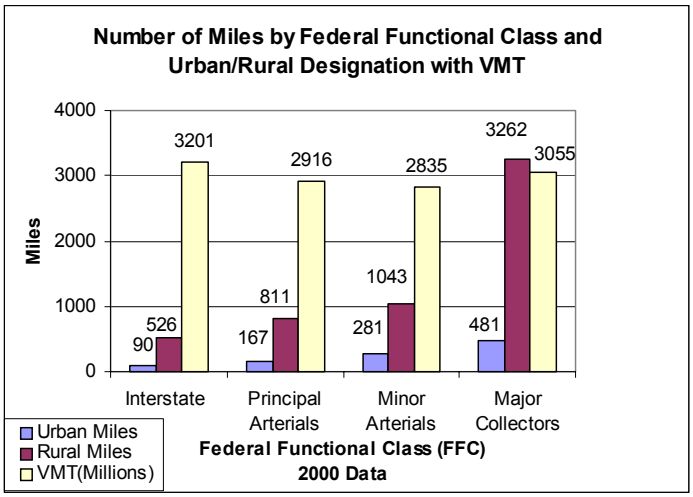
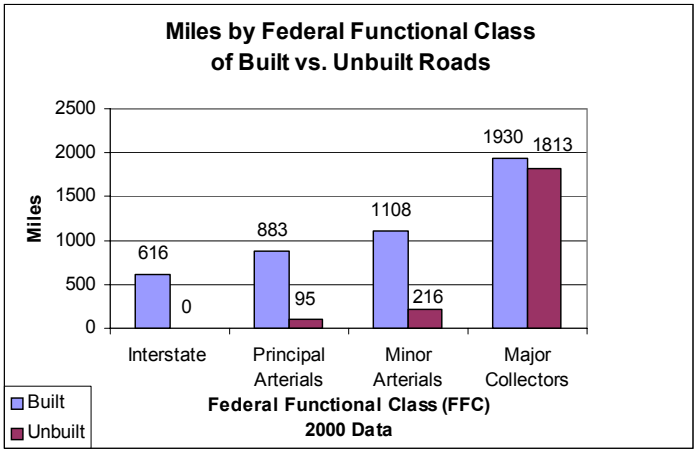
Highway: Assets and Condition

Assets

There are 22,700 miles of public roads in the State of Maine. Of that mileage, more than 8,300 miles are state responsibility. The majority of traffic is carried on these roads. The following graphic shows the miles of road in the state by Federal Functional Class (FFC) with Vechicle Miles Traveled (VMT).

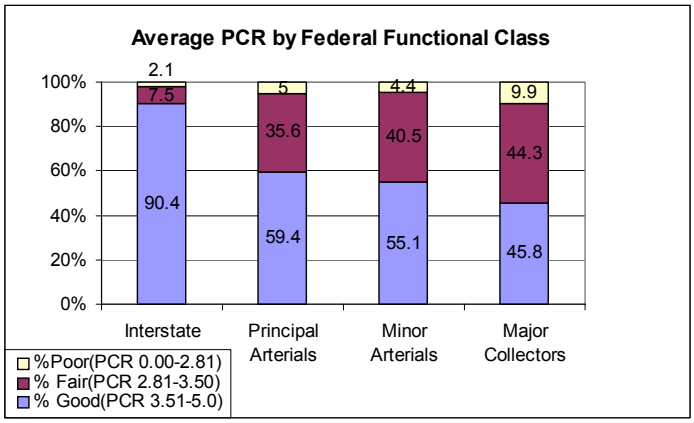


Maine's highways can be split into two distinct categories: built and unbuilt. A built road is defined as one that has been constructed to a modern standard, usually post-1950. This includes adequate drainage, base and pavement to carry the traffic load with adequate sight distance and width to meet current safety standards. Unbuilt roads (backlog) are defined as roadway sections that do not meet one or more of the characteristics of a modern highway.

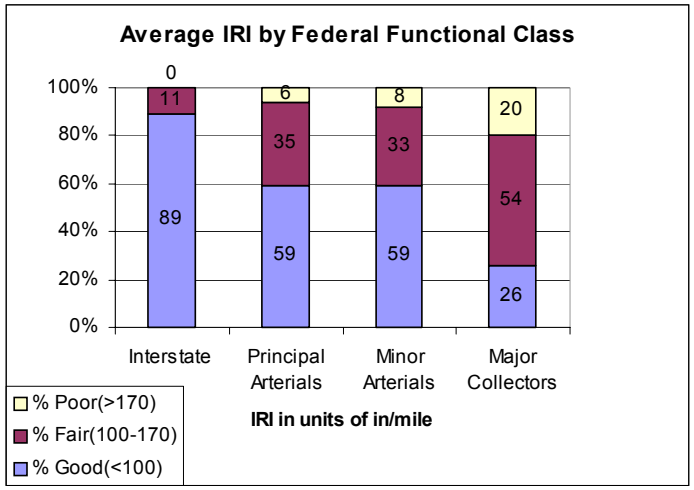


Condition

Pavement Condition Rating (PCR) is defined as the composite condition of the pavement on a roadway. The PCR is compiled from the severity and extent of pavement distresses such as cracking, rutting, and ride quality. The rating system uses a scale of 5.00 (perfect) to 0.00 (fully deteriorated). The PCR is the condition of the pavement only, not necessarily a reflection of the condition of the roadway base structure.



Ride quality is a key indicator of customer satisfaction. Ride quality is expressed in terms of International Roughness Index (IRI) and is measured in inches per mile. IRI is a measurement of the inches of vertical displacement experienced by a vehicle in a mile of roadway. The lower the IRI, the smoother the ride will be. The average IRI on Maine's roads is less than 170 in/mile, and is considered "acceptable" by the Federal Highway Administration. The range of IRI on Maine's roads is a low of 47 in/mile to a high of 330 in/mile.

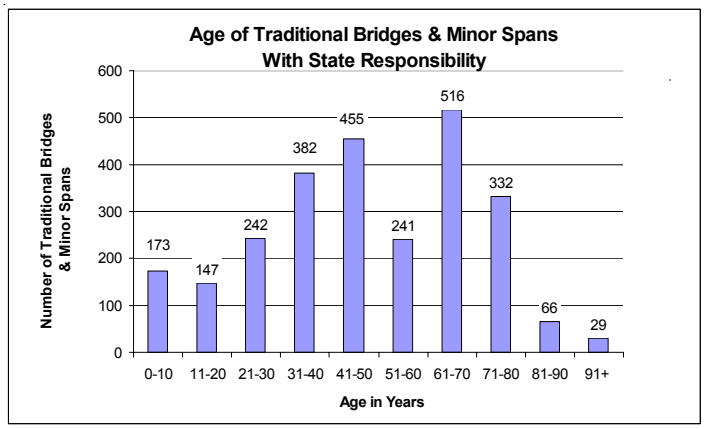


Bridges: Assets and Condition

Assets

The State of Maine has full responsibility for capital improvement and maintenance of 769 minor spans, 1,953 traditional bridges, and 19 extraordinary bridges. Minor spans are generally 10-20 feet long and traditional bridges are generally greater than or equal to 20 feet long. Extraordinary bridges are 250 feet or more in length, have an improvement cost of at least $5 million and need capital improvements in the next 20 years.

Of the 2,960 structures with full or partial state responsibility, there are 2,583 traditional structures and 377 steel culverts. The traditional structures (non-steel culverts) have an average service life of about 80 years while the bridge/minor span steel culverts have an average service life of about 50 years.

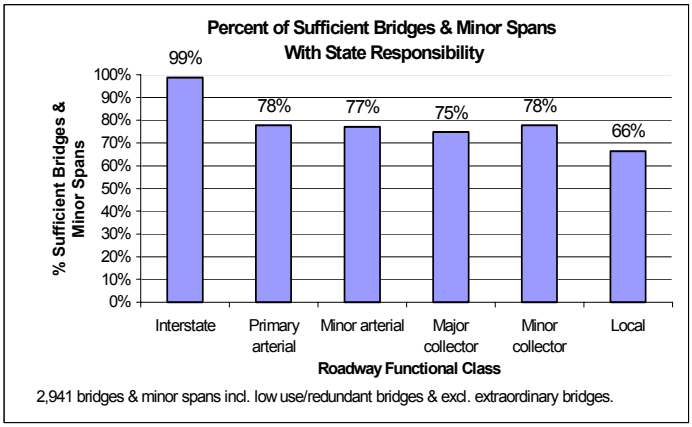


Deer Isle-Sedgwick Bridge

Condition

Maine's bridge and minor span network is evaluated in terms of the following indicators: percent sufficient, federal sufficiency rating weighted by deck area, priority functional needs, and extraordinary bridge needs. In aggregate, these indicators provide valuable insight for the State's current bridge and minor span inventory. The age distribution of Maine's structures is only one indicator of future needs, and should not soley be relied upon to determine the timing of improvements.

Using federal *sufficiency rating* procedures (a single number - 0% is worst and 100% is best), the percent sufficient indicator will identify those structures that are structurally and functionally sufficient. Bridges and minor spans are considered sufficient if the federal sufficiency rating is greater than 60 indicating that capital improvement is not likely for at least 10 years, except for the possibility of paint or wearing surface work.



2,941 bridges & minor spans incl. low use/redundant bridges & excl. extraordinary bridges.

West Branch Bridge, Rt. 17 Byron

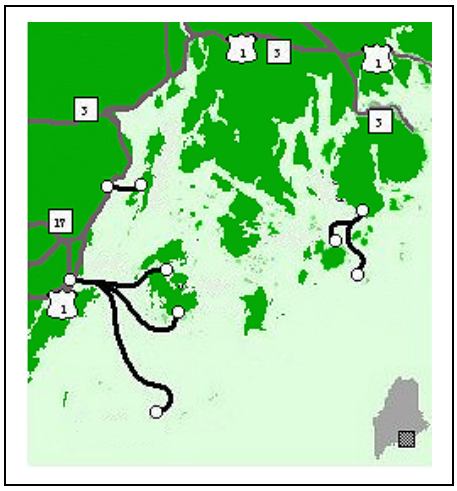
Passenger and Freight Transportation

Passenger Transportation

- Ridership on ferries, airplanes, and buses, from 1994-2000, grew from 5.3 million to 6.4 million, a 20% increase.

- Passenger rail service returned to Maine in 2001 with Amtrak service between Portland and Boston. To date, revenues have exceeded projections.
- MaineDOT is currently upgrading the state-owned Rockland Branch rail line from Brunswick to Rockland (56 miles) for passenger and freight use.
- Maine is served by a variety of public and private ferry services. The Maine State Ferry Service (MSFS) serves six year-round island communities. In recent years the MSFS has implemented an aggressive maintenance program for vessels and facilities.

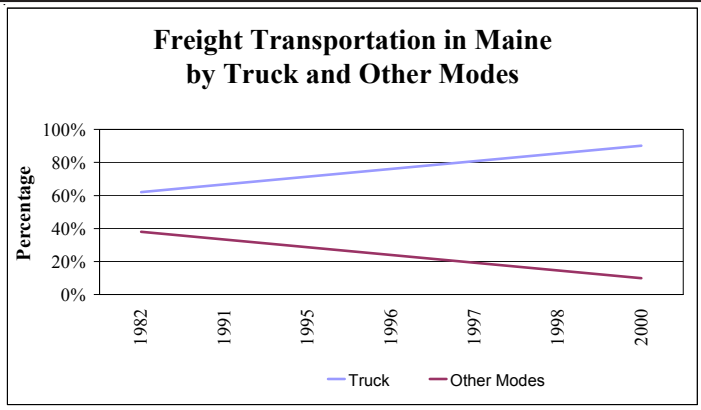
MSFS Routes



- The Maine State Airport System provides six commercial service airports and 30 municipally-owned general aviation airports. Over the past 30 years, the airports in Maine have received approximately $120 million in state and federal funds.

Freight Transportation

MaineDOT supports the development of a free-flowing intermodal freight system that provides Maine shippers more choices among modes, increased productivity, improved environmental benefit, better balance between modes, and reduced transportation costs. This is a difficult challenge.



- In 1998, motor carriers shipped 89% of Maine's manufactured freight.The great preponderanceof truck freight market share in Maine reflects the nation-wide business trend toward just-in-time delivery. MaineDOT initiatives like the Heavy Haul Truck Network and Commercial Vechicle Service Plan seek to insure the safer and more efficient flow of truck traffic in Maine.
- Maine is served by six railroad companies, which move over eight million tons of freight per year over 1,200 miles of active track. Rail is critical to Maine's manufacturing base. The State of Maine owns over 300 miles of track.
- The State, in following a Three Port Strategy, has provided substantial economic support for the development of three cargo ports—Eastport, Searsport, and Portland. These facilities handle: forest products; liquid and drybulk products; petroleum, bulk and breakbulk cargoes; aiding the fishing and aquaculture industries. The Maine Port Authority works closely with MaineDOT on seaport development. Our cargo port system provides windows for Maine's international trade for both imports and exports.
- Rail/truck intermodal facilities are located in Auburn, Waterville, and Presque Isle.

Rail/Truck Intermodal Facility, Waterville

- Air freight, utilized for the shipment of low-weight, high-value commodities, moves primarily through the Portland International Jetport, the Bangor International Airport, and the Auburn-Lewiston Municipal Airport.

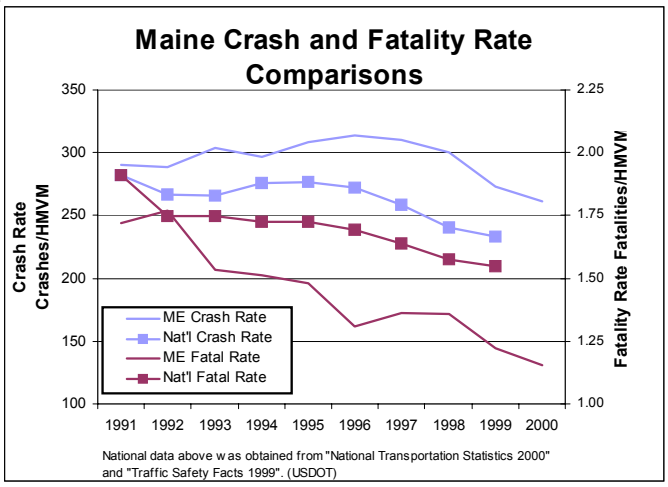
System Performance: Safety

Safety is a key consideration in every MaineDOT project. Additionally,the safety of Maine's roads has improved steadily over the past ten years. A variety of measures have contributed to this improvement including:

- **Vehicle safety improvements**
- **Education programs**
- **Law enforcement**
- **Infrastructure improvements**

Maine's Highway Safety Improvement Program is dedicated to improving transportation safety in Maine. It provides approximately $4.7 million per biennium to address roadside safety hazards and $2.0 million per biennium to improve railroad grade crossings at public roads.

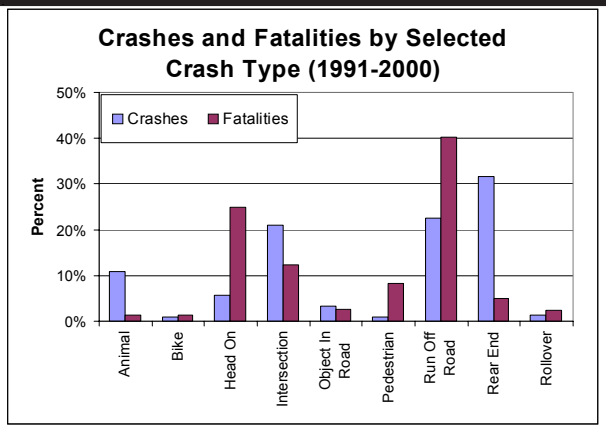
Maine's crash and fatality rates have dropped 10% and 33%, respectively, over the past ten years (1991 - 2000). The crash rate has remained above the national



average, but the fatality rate continues to be below the national rate, and has dropped at a significantly greater rate.

While the reductions in both the crash and fatality rates are encouraging, there are some disturbing trends that should be addressed to continue the improvement. The safety areas of particular concern include:

- **Work Zone** crashes have accounted for over 7,200 crashes and 25 fatalities over the past ten years. Work zone safety is a major concern both nationally and in Maine.



- **Run Off Road and Head On crashes on Rural Non-Interstate Roads** combined account for over 60% of all fatalities on Maine roads. Clearly, this is an area where increased vigilance will be required. MaineDOT has recently undertaken an initiative to develop a "toolbox" of traditional and non-traditional tools to reduce both the incidence and severity of these types of crashes.
- **Commercial Vehicles** Crashes continue to rise as more freight is diverted from rail to trucks.
- **Large Animals** crashes in Maine have increased by over 70% in the past ten years.
- **Human Factors** account for at least 80% of all crashes, according to data provided in police crash reports. The primary contributing factors in crashes include Driver Inattention (25%), Failure to Yield (13%), Illegal or Unsafe Speed (12%) and Following Too Close (6%). MaineDOT has undertaken a new initiative to address driver-related safety issues. "Be A Road Model" is a high-profile public awareness program that airs on television station WGME-13.

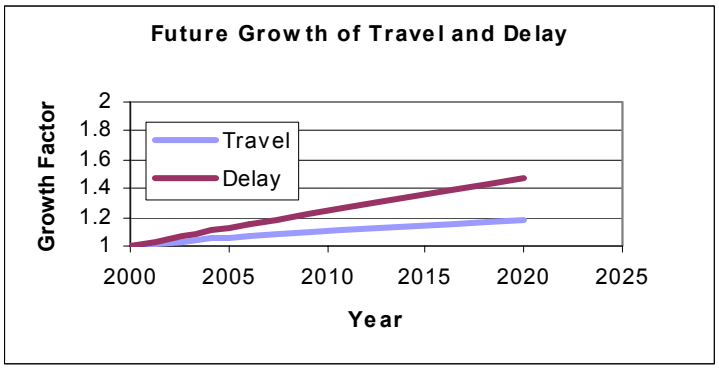
Several innovative safety programs have been initiated to address these and other areas of concern, including:

- Work Zone Safety Awareness Week activities
- Revised Utility Pole Location Policy
- Revised Design Standards
- Guardrail Improvement Program
- Multi-agency efforts to increase commercial vehicle safety and reduce crashes involving large animals
- Innovative warning systems at non-signalized intersections (35% reduction in conflicts).

System Performance: Highway Mobility

Mobility is the ability of people and goods to move from one place to another. Arterials, the most important links in the highway system provide most of the mobility in Maine. While only representing 12% of the road mileage, arterials account for more than 60% of the vehicle-miles traveled (VMT) statewide. Therefore, the performance of the arterials, in serving the mobility needs of the state, is an important part of the system evaluation.

In the year 2000, statewide VMT was approximately 14 billion. Projected growth in travel over the next 20 years will increase statewide VMT to 17 billion. As traffic volumes increase, the utilization of available arterial capacity will also increase. If no investments to improve the existing arterial network are made, traffic congestion will increase more rapidly than VMT. The following chart shows the relative growth of VMT and congestion (delay) from 2000 to 2020.



However, MaineDOT has a history of making investments to enhance highway mobility. Over the last three Biennial Transportation Improvement Programs (BTIPs), the level of funding for mobility-enhancing highway projects has averaged $40 million per biennium. If this were to continue for the next 20 years, the investment in highway mobility projects would total $400 million in the equivalent of $20 million annual increments. This is the "status quo" level of investment for mobility purposes.

A variety of strategies are available to enhance mobility on Maine's arterial highways. In addition to investments in alternative modes, which provide new options for passenger and freight movement, major mobility-enhancing strategies include the following highway treatments:

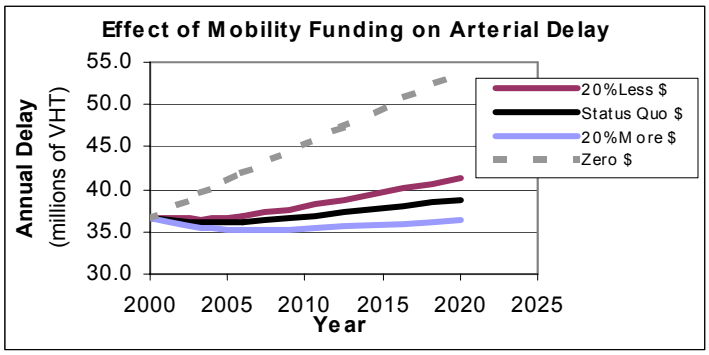
- **Access Management** - to preserve and enhance the mobility and safety qualities of existing highways.
- **Installing Auxiliary Lanes** - for left turns, right turns, climbing and passing.
- **Widening for Through Lanes** - for additional capacity on existing highways.
- **New Through Lanes at a New Location** - for additional capacity by passing existing highways.

Optimum investments of funds will result in a mix of investments best suited to improving mobility in the arterial network. The table below shows the potential mixes of these strategies for three funding scenarios. Traditional investment in additional through lanes, where needed, continues to be a major part of the investment mix. However, a significant share of the investment should be directed toward access management.

Mix of Strategies Under Three Funding Scenarios

FUNDING SCENARIO	20% LESS	STATUS QUO	20% MORE
Annual Investment ($ millions)	16	20	24
MOBILITY IMPROVEMENT STRATEGY	INVESTMENT SHARE		
Access Management	30%	28%	26%
Installing Auxiliary Lanes	18%	18%	18%
Widening for Through Lanes	30%	31%	32%
New Through Lanes at New Location	22%	23%	24%

Investments in mobility-enhancing strategies can manage the growth of congestion on the arterial system. The following chart shows that higher funding scenarios can do more to minimize congestion, but even funding that is 20% less than the status quo manages delay far better than no highway mobility funding at all.



Highway Adequacy

Treatments to Maine's highways can be placed in two categories, Major Treatments and Pavement Preservation. The distinct difference in these two categories of improvements is the expected service life. A Major Treatment can be expected to last 15-20 years and would remove a roadway from the unbuilt (backlog) listing. A pavement preservation project is done to a previously built roadway, with an expected service life of 6-12 years.

An analysis of the last 15 years of highway treatments has given the Department a data set of the most recent highway treatment for nearly 90% of the system. In summary the capital improvement program has provided:

- resurfacing of 25%-30% of the Arterial System every six years;
- a major treatment to 3% to 5% of the Arterial System every six years;
- a major treatment to 17% of the Interstate System in the last six years;
- 32% (2,124 miles) of the Arterial and Major Collector System is still unbuilt.

As indicated by the table below, there has been a significant increase in investment in both the Pavement Preservation Program and the Highway Improvement Program (major treatments). Over the last three BTIPs, there has been a 59% increase in resurfacing funding and a 44% increase in highway improvement funding. In the 2002-2003 BTIP over 620 miles of highway were addressed by one of these treatment methods.

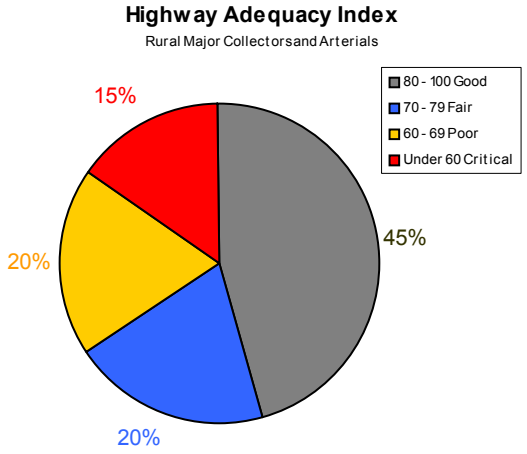
Summary of Highway Improvements
FY 1998-1999, FY 2000-2001, FY 2002-2003
(Cost in Millions)

	1998-1999 BTIP		2000-2001 BTIP		2002-2003 BTIP	
	Miles	Cost	Miles	Cost	Miles	Cost
Highway Improvements (Major Treatments)						
Principal Arterial	30.8	$45.2	22.9	$33.9	28.1	$38.6
Minor Arterial	39.4	$28.9	20.2	$22.4	27.5	$28.7
Major Collector	36.4	$19.9	101.4	$44.1	110.8	$68.9
Minor Collector	39.1	$12.5	25.4	$4.4	55.1	$17.5
Total Improvement	**145.7**	**$106.5**	**169.9**	**$104.8**	**221.5**	**$153.7**
Resurfacing (Pavement Preservation)						
Interstate	86.0	$14.3	64.0	$12.4	44.6	$9.7
Principal Arterial	67.0	$14.6	119.0	$21.8	80.9	$20.6
Minor Arterial	123.0	$16.1	137.0	$22.7	139.5	$31.7
Major Collector	184.0	$12.6	149.0	$19.1	135.9	$29.4
Total Resurfacing	**460.0**	**$57.6**	**469.0**	**$76.0**	**400.9**	**$91.4**

The Highway Adequacy Index is an empirical evaluation of the health of a particular highway segment. The Adequacy Index is based on 6 basic elements of the condition or performance of the roadway. These basic elements are listed in the following table with their respective point weighting;

Data Element	Arterials & Collectors Point weighting:
PCR (Pavement Condition Rating)	45
Safety	20
Built vs Unbuilt	15
AADT/C (see 4.3.2)	10
Posted Speed	5
Paved Shoulder	5
Total	**100**

The Adequacy Index on rural roadways depicted below indicates that 45% of the roadway mileage is considered "good", with an index of at least 80, while 15% of the highway mileage is considered to be "critical".

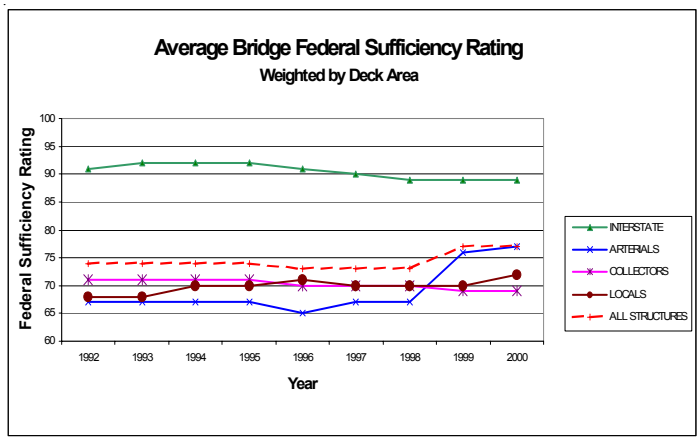


- 94% of Interstate/Freeway is rated "good".
- Nearly 80% of non-Interstate Arterial Highways are rated 70 or higher, which is considered either "fair" or "good".
- 21% rural Major Collector Highways are rated less than 60, which is considered "critical".

Bridge Adequacy

Bridge adequacy has been measured using several indicators in this report, but the federal sufficiency rating is the most telling. The federal sufficiency rating is based on a combination of four factors used to determine a number from 0 to 100 (0 is worst, 100 is best) that describes the overall sufficiency of each structure. The four factors are 1) Structural Adequacy and Safety, 2) Serviceability and Functional Obsolescence, 3) Necessity for Public Use and 4) Special Reductions (detour length, traffic safety features).

The 1992 to 2000 chart below is based on the federal sufficiency ratings of all 2,960 structures for which the state has responsibility, including extraordinary bridges. This indicator has proven quite consistent over time, with the exception of a significant increase in 1999 for bridges carrying arterial highways. This increase is attributed to the significant investments made to improve extraordinary bridges (carrying arterials) in the last six years.



As one might expect, the structures carrying higher federal functional class roadways are in the best condition, reflecting MaineDOT's commitment to funding improvements for those structures that afford the most benefit to Maine's people and economy.

The following table summarizes investments in various types of structures over the last three bienniums. About 40% of all bridge dollars have been spent to improve extraordinary bridges, thereby reducing the extraordinary bridge backlog by nearly half since 1994.

Summary of Bridge Improvements
FY 1998-1999, FY 2000-2001, FY 2002-2003
(Cost in Millions)

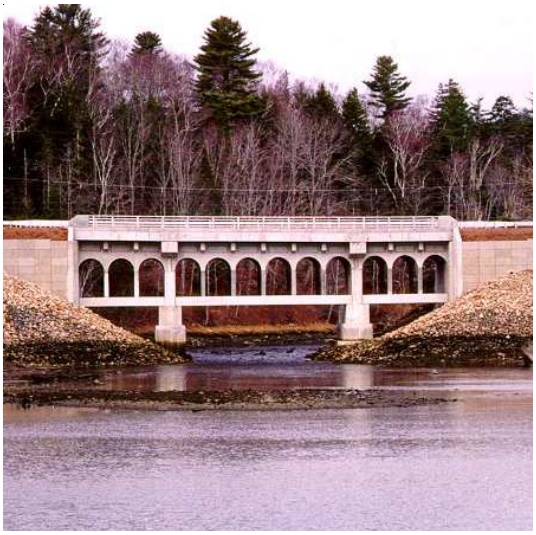
	1998-1999 BTIP		2000-2001 BTIP		2002-2003 BTIP	
	Projects	Cost	Projects	Cost	Projects	Cost
Bridges	61	$44.9	56	$43.0	51	$44.1
Minor Spans	17	$2.9	22	$3.4	41	$8.1
Extraordinary	3	$67.1	5	$23.0	5	$35.3
Total Improvement	**81**	**$114.9**	**83**	**$69.4**	**97**	**$87.5**

Note* Projects programmed for preliminary engineering only were excluded and costs were taken from published BTIPs.

Excluding extraordinary bridges, the funding for bridges (as shown in the table above) has remained relatively stable over the last three bienniums and the percentage of sufficient bridges increased slightly to 80% in 2000.

However, the funding for minor spans has more than doubled in the 2002/03 BTIP. This increase in funding for minor spans was necessary because there has been a significant downward trend in sufficiency for these structures. In the year 2000, 75% of the minor spans with state responsibility were sufficient, down from 87% in 1992.

Extraordinary bridge funding has shown considerable fluctuation over the last three bienniums with a high of $67 million in the 1998/99 BTIP. About 75% of the extraordinary bridge funds in the 1998/99 BTIP were committed to the replacement of the Carlton Bridge in Bath-Woolwich. The Carlton Bridge project also received $3 million in the 2000/01 BTIP and an additional $16.5 million in the 2002/03 BTIP. Despite the significant investment in extraordinary bridges over the last six years, $248.4 million of work remains to be done on 19 of these bridges over the next 20 years.



Ducktrap River Bridge, Rt. 1 Lincolnville

System Needs: Highway

The Department's highway expenditures can be divided into three distinct categories: Highway Improvements, Pavement Preservation, and Maintenance Paving.

Highway Improvements may include a range of treatments applied to a previously unbuilt section of roadway. Available treatments include: new construction, reconstruction, rehabilitation, and reclamation. Treatments for each section of roadway are selected based on what improvement is needed at that location to meet current standards and carry the traffic load.

Cost to Construct Maine's Unbuilt Arterials and Major Collectors

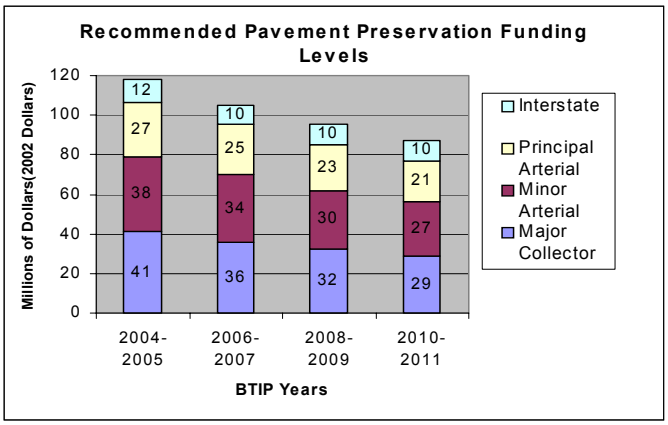
FFC	Unbuilt Miles	Cost per Mile	Total Cost
Principal Arterials	90	$1,500,000	$136,870,000
Minor Arterials	216	$1,500,000	$333,150,000
Major Collectors	1813	$450,000	$816,000,000
Total	**2119**		**$1,286,000,000**

MaineDOT is operating under a 1999 legislative mandate to submit biennial improvement programs that address all previously unbuilt portions of the rural arterial highway system by 2009. In response to this mandate MaineDOT will strive to program 60 miles of rural arterial highway improvements per biennium.

The Collector Highway Improvement Program (CHIP) targets the unbuilt portions of the major collector highway system. The goal of CHIP projects is to stay within existing right-of-way, minimize alignment changes, meet state design standards, eliminate seasonal weight restrictions, and achieve a 12-15 year design life. Since the CHIP began in 1998, 219 miles have been improved at a cost of $82 million. Using traditional improvement methods that same $82 million may have resulted in improvements to only 65 miles.

The **Pavement Preservation** philosophy at MaineDOT is to maintain the condition of the built system before expending resources to improve unbuilt portions of the highway system. More miles of roadway can be treated at a lower cost per mile, thus maintaining the integrity of the system as a whole. This has proven to be a more cost effective method of maintaining the system than the 'worst first,' which dictates treating the worst roads in the system first, and leaving the better roads untreated.

In the 2002-03 BTIP, MaineDOT programmed nearly 401 miles of roadway for pavement preservation projects with an average cost of $230,000 per mile on non-interstate projects. At this rate of treatment it will take 22 years to treat the over 3900 miles of built highway. The design life of these treatments is only 10-12 years, which results in a severe programmatic gap. In order to close this programmatic gap there is a need for 325 miles of pavement preservation treatments per year. At the current unit price of $230,000 per mile, the need would be nearly $150 million per biennium. With the implementation of pavement preventative maintenance, the average cost per mile will be reduced to $160,000 initially with further reductions anticipated in subsequent cycles.



The need for pavement preservation projects in 2004-05, utilizing pavement preventative maintenance strategies, is 900 miles or $118 million, including Interstate mileage. This represents an increase in mileage of 125% over previous programs with only an 18% increase in funding.

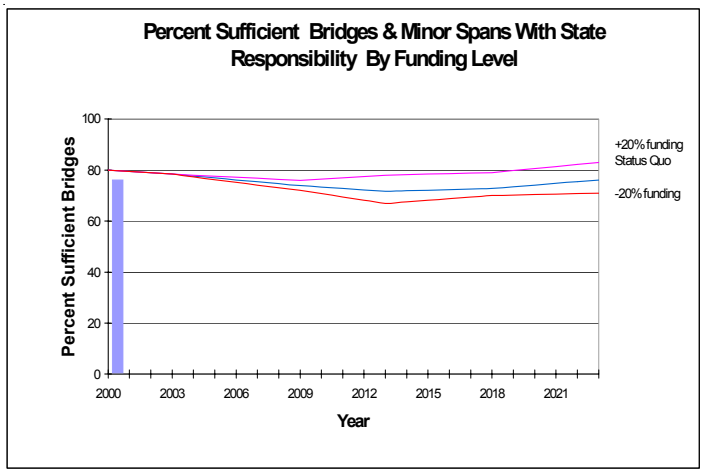
Maintenance Paving is a pavement treatment used as a holding action on unbuilt roads until a more significant treatment can be applied. The last three biennial programs have each addressed over 1,400 miles of unbuilt highway with maintenance paving treatments.

Optimum investment in the highway system would consist of a mix in spending on pavement preservation and highway improvements to unbuilt roadways. During times of reduced funding, available funds should be applied to the preservation of the built system to protect the significant investment in that system. Any additional funding available after all preservation needs have been met can be applied to upgrading the unbuilt highways.

System Needs: Bridge

In 2000, 80% of the bridges carrying town ways, state highways, and state aid roads were sufficient and 75% of the minor spans with state responsibility were sufficient. If MaineDOT continues to invest at the current level of $95 million per biennium (2002 $), the condition of both the bridges and the minor spans will decline to 76% sufficient in 20 years.

It is projected that a 20% increase in funding would bring 83% percent of the bridges and minor spans to sufficient condition in 20 years, while a 20% decrease in funding would result in only 71% of the structures being in sufficient condition in 20 years.



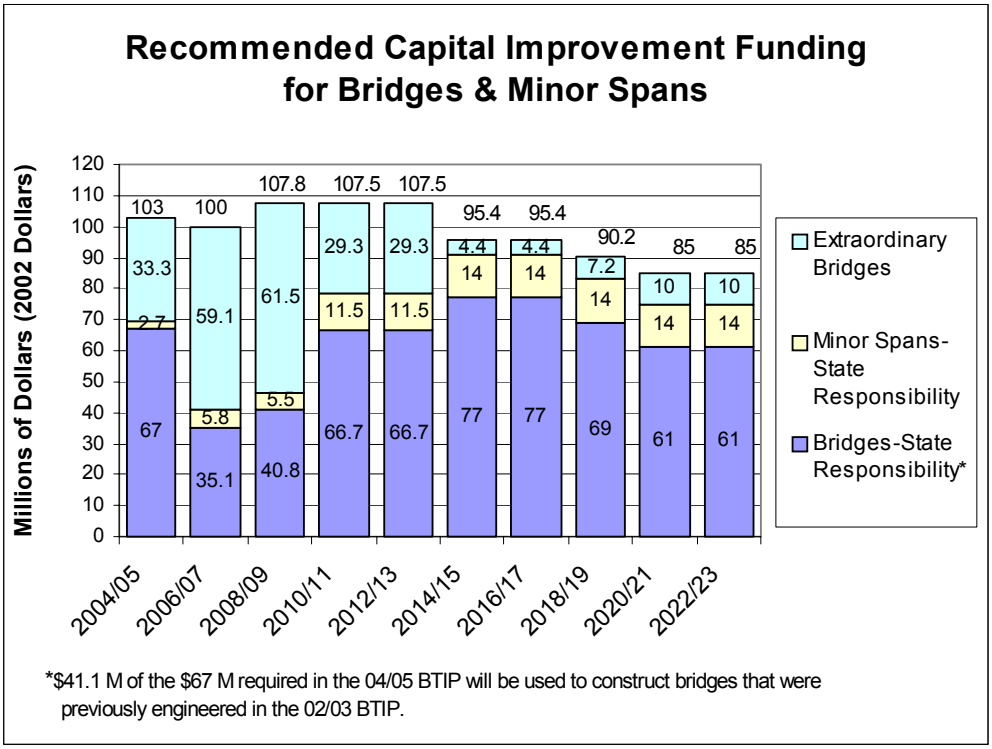
Over time, inflation may cause the improvement costs to rise to $5 million or more. At that point, these traditional structures will qualify as extraordinary bridges by definition, and will no longer be classified as traditional bridges.

On average, MaineDOT has expended $95 million per BTIP to address structural needs over the last six years, with about 40% of these funds committed to reduce the backlog of extraordinary bridge needs. However, the current status quo level of funding will not address the projected capital improvement needs of Maine's structures. MaineDOT is facing an increased demand for funding of bridges and minor spans over the next 15 years.

There are two primary reasons for the increased need for funding. First, MaineDOT must continue to address extraordinary bridge needs. While the extraordinary bridge backlog decreased significantly over the past eight years, there still remains an additional $248.4 million of work to be done on 19 bridges over the next 20 years. Of this $248.4 million, $154 million (62 %) is needed for extraordinary bridge improvements in the next six years. Second, there is an approaching peak for bridge needs in about eight years. This peak is a result of the end of service life for post-depression era bridges and end of deck life (and paint) for Interstate Highway bridges.

The scopes, costs, and timing of future improvements were individually determined using inspection ratings and inventory data and are based in part on field reviews conducted by bridge engineers and environmental scientists.

The adjacent chart depicts the funding levels necessary to address the bridge, minor span and extraordinary bridge needs statewide over the next 20 years. There are some traditional bridges that are 250 feet or more in length with capital improvement costs approaching $5 million.



*$41.1 M of the $67 M required in the 04/05 BTIP will be used to construct bridges that were previously engineered in the 02/03 BTIP.